



Societal Factors that Impact Retention and Graduation of Underrepresented Computer Science Undergraduates

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ABSTRACT

Lack of diversity and high dropout rates among underrepresented students plague the CS discipline. We developed, administered, and validated survey scales measuring social factors that impact the retention and graduation of underrepresented CS undergrads at two institutions. Results revealed significant differences between students who identify as men vs. women in terms of computing identity and confidence, and between black and non-black students in terms of familiarity with future opportunities.

1 INTRODUCTION

The representation of women and underrepresented minorities (URMs) in the US computing industry is only a fraction of their representation in the national population [1]. The problem is further compounded by high dropout rates from computer science programs [2]. To resolve the underrepresentation issue, it is important to increase participation in CS education for students who have historically been underrepresented in the discipline [3].

While studies have attempted to understand what influences individuals to complete their CS studies, only a few have focused on retention among women and URMs. Those that do (e.g., [4]) often focus on STEM. Research has suggested that social factors, such as community reinforcement, may help retain women in computing [5]. Our study seeks to measure social factors that impact the retention and graduation of women and URMs and identify demographic-related differences in those factors.

2 METHODS

We collected data from 184 undergraduate CS students: 162 from an R1 Primarily White Institution (PWI) and 22 from an HBCU that does not have a graduate program. We collected race and gender as self-reported items; 72.28% of participants were men, 27.17% women, and 0.54% non-binary; 19.02% were black. A questionnaire was developed to measure social factors that have been shown to impact retention and graduation based on existing scales in the literature.

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3 RESULTS AND IMPLICATIONS

Our exploratory and confirmatory factor analyses produced 9 robust scales measuring students' perceived lack of relevance of CS, attitude towards CS, computing identity, study effort, familiarity with future opportunities, persistence, leadership, confidence, and perceptions of social support. We were unable to create robust factors for 4 scales intending to measure students' beliefs about computer scientists, current experience, prior experience, and intentions to continue their CS trajectory.

In line with [6], we found that women had lower levels of computing identity (9.53 vs. 10.91 of 16), $t(76.7) = 2.73$, $p = .008$, $d = 0.622$) than men. This may explain their lower level of confidence (24.20 vs. 25.92 of 32), $t(80.8) = 2.88$, $p = .005$, $d = 0.641$). We also found that Black students had a higher level of familiarity with future opportunities than non-Black students (3.73 vs. 3.02 of 8), $t(42.9) = 2.15$, $p = .037$, $d = 0.657$. Interestingly, we found that students at the HBCU had a higher level of familiarity with future opportunities than Black students at the PWI (4.00 vs. 3.31, *ns*).

Improving women's sense of belonging may be vital to improving their confidence—a key factor in undergraduate success. This may involve increasing their exposure to role models, e.g., by organizing alumni events and improving faculty representation. Similar strategies may improve black students' familiarity with future opportunities.

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